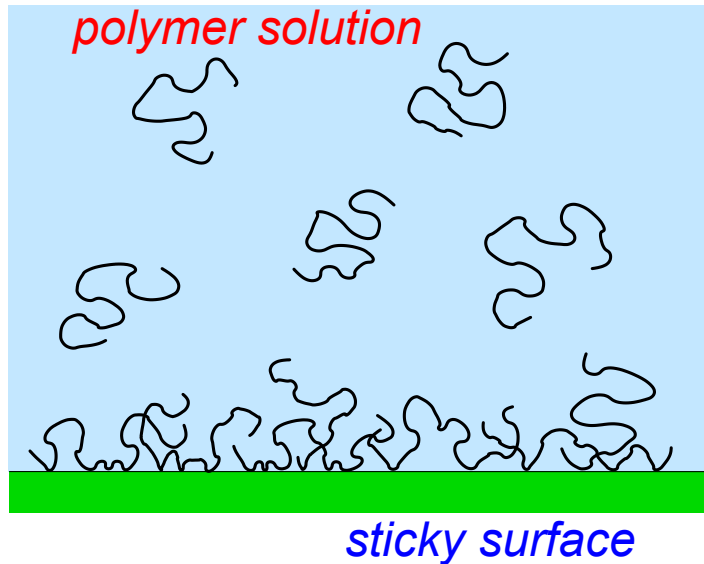


Theory of Non-Equilibrium Polymer Layers

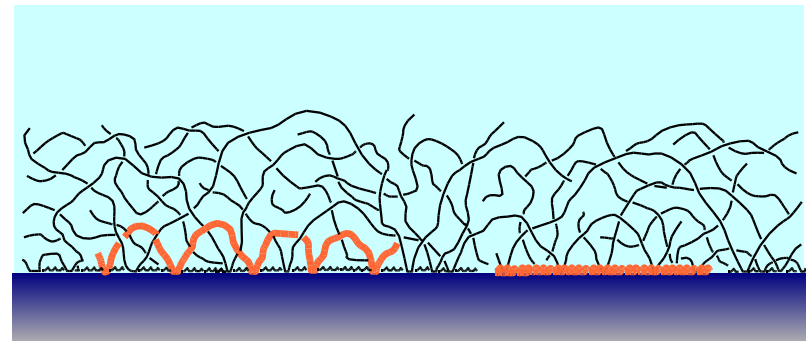
Ben O'Shaughnessy, Columbia University, DMR 9816374



Irreversible
chain adsorption



Non-equilibrium layers



- ❑ Polymer solutions have powerful tendency to deposit polymer layers at even weakly attractive surfaces
- ❑ Physics of these soft interfaces is a major research area in polymer science
- ❑ Coating, lubrication, and other technologies rely on this effect
- ❑ Theory of equilibrium layers is well-developed

- ❑ Very sticky surfaces (e.g. hydrogen bonding, DNA, proteins, chemisorption)
- ❑ **Our research:** What is structure/kinetics of non-equilibrium layers?
- ❑ **Our findings:** Chain configurations are frozen in and different from equilibrium; overall density profile the same

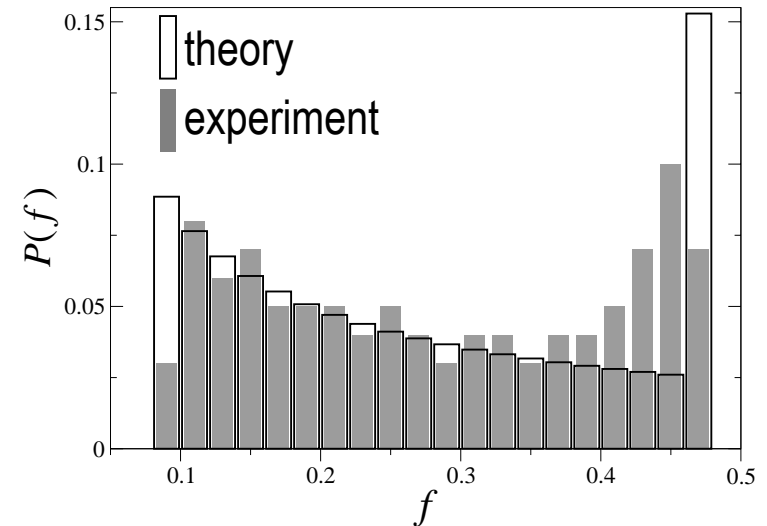
Theory of Non-Equilibrium Polymer Layers

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- We find density profile $c(z) \sim z^{-4/3}$, same as for equilibrium layers
- Structure fundamentally different: inner tightly bound layer, outer tenuously attached zone
- Individual chain configurations very different to equilibrium. Our theory predicts a distribution of chain surface contact fractions $P(f) \sim f^{-4/5}$ close to experimental findings
- Single chain size $\sim N^{3/5}$ (N is chain length), different to equilibrium layers where chain size is $\sim N^{1/2}$
- Other work: Irreversible chemisorption from melts

Trained researcher:
Dimitrios Vavylonis
(graduate student, continued as postdoc)

Distribution of surface contact fractions



Melt chemisorption: frozen loop hierarchy

